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A FURTHER STUDY

OF THE

Therapeutic Value of Oxygen  
With Cases Treated.

BY

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# A FURTHER STUDY

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# THERAPEUTIC VALUE OF OXYGEN.

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**R**EGARDING the availability and applicability of factitious oxygen as a therapeutic agent, there has prevailed and still prevails, a very general professional misconception. This stereotyped estimate is based on the reports of early investigations, particularly those of Lavoisier, who asserted that his birds, dogs, rabbits and guinea-pigs, when immersed for a short time in an apartment or receiver filled with crude oxygen gas (derived from and doubtless tainted by the bungling decomposition of an oxide of mercury), became excited and preternaturally lively, which condition was followed by more or less physiological depression. Considering the crude state of chemical science at the time, and the questionable processes employed, it is easy to understand that these results were not necessarily attributable to the newly discovered gas, the nature of which was being eagerly and none too honestly investigated. These hasty and superficial impressions seem to have been accepted without question and without satisfactory verification ; and, what is more surprising, they have ever since remained as accepted dogmas in the world of physiological chemistry. In the century that has since elapsed chemistry and physiology have both been revolutionized ; but with all the progress made in this direction few text-book authorities have thought it worth while to investigate the oxygen group from a fresh standpoint, or to disturb the fos-

siliferous strata of scientific thought handed down from the latter end of the eighteenth century.

The later French and German authorities have not added much to our knowledge of this agent, their experiments partaking more of the brilliantly curious than of the practical form. Some of them have shown, at least to their own satisfaction, that there is a saturation point of the blood beyond which it refuses to absorb any more oxygen; overlooking the imminent and practical fact that the average human being, living under ordinary civilized circumstances, seldom approximates the saturation point, and that ordinary mortals are in about as much danger of being translated as of damaging themselves by an excess of the vital element in question. To this dead-level of authorities there are a few notable exceptions. Phillips cautiously, but convincingly, combats the prevailing misconceptions, and our own Dalton refutes many of the absurd conclusions which had so long stood unquestioned. It is now known that the decarbonization of the blood is not the principal office of the oxygen derived from atmospheric inspiration. The experiments of Magnus show that from ten to twenty-five per cent. of the oxygen inspired by a human adult is absorbed directly and in a free state, into the blood. The affinity of blood, arterial as well as venous, for oxygen, is shown to be very great. Compared with that of water the ratio is as  $2\frac{1}{2}$  to 1. This is doubtless the key note to the action of oxygen, therapeutically exhibited.

Dalton has shown that the carbon dioxide constantly exhaled by all animal bodies is not all formed by contact of the circulating fluid with the oxygen of the air. *It already exists in venous blood before it reaches the lungs.* Hence, it is constantly being formed in the tissues themselves, as well as in arterial blood; since the same authority shows that both carbon dioxide and free oxygen exist in arterial blood. According to Magnus there is a nearly constant relation between them, the mean proportion



being, by volume, as 10 to 25 in arterial, and as 10 to 40 in venous blood. If these premises be accepted, and no one has as yet disputed them, carbon dioxide is not, as generally taught, wholly the product of respiration. No doubt a small portion of that expired is formed at the moment of contact of atmospheric oxygen with the carbon-loaded blood as it reaches the air-cell, but more of it already exists in the circulating fluid. The venous system is thus seen to be a collector of waste products—the complex sewerage of the vital economy. In the pulmonary circulation oxygen is freely and promptly absorbed, and carbon dioxide given off, while in the systemic circulation oxygen disappears and is constantly being utilized in the various processes of reconstruction.

It is evident that the ancient assumption respecting vital combustion is very imperfect as an explanation of the office of oxygen. In fact, modern physiologists have proved that the whole theory of heat production in the animal system, considered as a direct result of combustion, is lame and unsatisfactory. It is a well-known law of physics as well as the result of common observation that slow oxidation is not the source of any considerable degree of heat, and vital caloric has another explanation than that of the combustion of carbonized material within the system.

What becomes of the 10 to 25 per cent. of oxygen so constantly absorbed by the blood? Is its office to supervise the general processes of metamorphosis, without which the animal cannot exist? Does it preside alike over digestion and assimilation, and does the absence of it render possible all the various forms of mal-assimilation, including those which result in glycosuria, lithæmia and the various diathesis—even the tubercular? Does it incidentally, here as elsewhere in nature, intercept toxic tendencies, destroy septic and putrefactive germs, prevent degenerative changes and retard or render inert the slowly forming elements of malignant growth? Is it

used in the end as an essential *materia alimentaria*? These are questions which have been asked, which are, in fact, constantly being insinuated by science, but have been as yet only empirically rather than satisfactorily or scientifically answered.

A large class of physicians at the present time flipantly dispose of the question of the therapeutic value of oxygen by citing the current saw about the saturation of the blood. They repeat that scientific stupidity which assumes that the free oxygen in the blood cannot be increased beyond the limited quantity which it constantly and readily receives from the ordinary atmosphere; and hence, that any attempt in this direction is not only uncalled for but practically futile. Granting that this assumption is true, the objection practically falls flat. If the human race could be turned adrift, in a body, and should lapse into the primitive life of nomads, it might be feasible for each individual to realize his due quota of the vitalizing element. Unfortunately civilization implies a sort of human hibernation, and the average modern individual is compelled to eke out his disease-pestered days on one-half this allowance, or even less. The result is inevitable. Functions are imperfectly and incompletely performed; changes and metamorphic processes, though initiated, necessarily flag and result in half-formed tissue, or in products inimical to the healthy organism. Toxic, carbonaceous elements accumulate, degenerative processes are set up, and chronic disease is the inevitable result, if even malignant demonstrations do not end the disastrous history.

These are homely facts, and they have no glamour of superficial laboratory erudition or bacillus-staining to give them mock dignity. Nevertheless, they appeal to the hard common sense of every practitioner of medicine who realizes how helpless he is to relieve the many and multiplying forms of disease constantly being analyzed by the aid of the scalpel and the microscope, with

a minuteness of detail which is fairly bewildering,—and which are the direct or remote results of this universal oxygen famine.

Inspired oxygen passes in a free state into the arterial blood and is distributed throughout the entire system, thus coming into intimate contact with every remotest tissue and cell. Keeping in view this fully admitted fact, how can its ultimate influence on the vital economy be estimated? It would be a waste of time to prove that the blood can and does, under certain circumstances, absorb an unwonted increment of oxygen, since, as already asserted, a large majority of the race live under conditions which positively prohibit the utilization of anything like a normal supply. That medical mountebanks have made capital out of the word oxygen is no concern of ours. They did the same for electricity, for hydrotherapy, movement cure, and massage; which, once extolled as panaceas, are now universally recognized as valuable and sometimes indispensable allies. But in spite of drawbacks in the shape of prejudice, time, care in manipulation, and expense, the medical use of oxygen and its principal ally, *nitrogen monoxide*, is steadily on the increase. A large number of reputable practitioners in this country are quietly experimenting with these agents, and carefully noting results. Abroad there is even more interest shown.

The subject is yet without a literature, but materials and data for this are steadily accumulating. Lately, Dr. Powell, of this city, read a suggestive paper before the New York Academy of Medicine on the use of ozone in phthisis. The February number of the *Southwestern Medical Gazette* has a short paper on the subject, by Professor F. C. Wilson. The *London Lancet*, of recent date, contains a short but pertinent paper on the remedial value of oxygen, and the columns of French, Italian, German and particularly Russian medical journals contain frequent reports of experiments in this field. Thus, a slow but steady progress in this direction is being made.



It is evident to the most casual observer that the medical science of the future must be largely based on a study of natural therapeutics. The artificial and far-fetched are daily losing caste. The profession long since lost faith in dispensatory routine, and the lay public is gradually becoming infected with the same skepticism. The heyday of pharmacomania has passed and the inevitable reaction has already set in. The routinists no longer take front rank. They must henceforth become the rear-guard and camp-followers of the army of progress.

Without realizing it the profession is quite generally commending oxygen. Every patient sent on a sea-voyage, or to the mountains, is a walking certificate as to its efficacy. Every argument in favor of open air life, roughing it on the plains, a sojourn in Southern California, Italy—in short all travel, is a plea for oxygen. Many of the newer antiseptics and parasitocides have been found to depend on free oxygen liberated during decomposition within the system, or in contact with the tissues. The terebene group may be cited as an example. Theories, however, are not so important as clinical facts. A few brief sketches of further cases treated are appended :

*Case 21.*—Mrs. S., age 32, suffering from chronic gastric catarrh of unusually severe type. After six weeks daily use of oxygen (modified and diluted), together with hot water drinking—very little attention being paid to her diet—she fully recovered, and became more robust than for many years.

*Case 22.*—Mrs. C. R., age 63. Suffered some years since with spinal meningitis and has never fully recovered. Convalescence was followed by epileptoid convulsions and hysterical phenomena of various kinds. At present is subject to paroxysms of dyspnœa, simulating œdema of the lungs. Each paroxysm it is thought will prove fatal. Modified oxygen was carried to the bedside



in rubber bags, twice daily, and during the intervals the patient was kept supplied with a solution of hydrogen dioxide which was vaporized and inhaled.

This treatment was continued for three weeks, with the gratifying result of clearing up the lungs, removing the dyspnœa, and greatly aiding the digestion, which had become seriously disordered. Nor was there any relapse on leaving off the remedy. This patient died six months later from degeneration of the cord (at least so reported by the attending physician), the dyspnœa not having returned.

*Case 23.*—P. E., age 22. Subject to periodic headache of so severe a type as to have injured his memory and caused ocular troubles. The paroxysms are generally a true migraine and of fairly explosive violence. They recur from once to three times per week quite regularly. Placed this patient on a mixture of O, N<sub>2</sub>O and common air, viz.:

R    O, two volumes.  
       N<sub>2</sub>O, one volume.  
       Common air, three volumes.

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Of which two to four gallons were inhaled night and morning.

Two weeks treatment greatly relieved the paroxysms, and in four weeks patient assures me he is no longer troubled. The head is cool, the eyes clear, and the paroxysms do not now recur.

*Case 24.*—Miss W. M., age 24, teacher. Has severe and constant cough, with "soreness" of the lungs, loss of appetite and general malaise. Is very much frightened lest it be already incurably seated "consumption." The family history is not favorable.

October 20.—Not being able to come to the office for treatment, is placed upon the daily use of the portable variety. Continuing the inhalations carefully night and morning for four weeks, she reports that her cough is gone and appetite excellent. The soreness no longer

troubles her, and she has given up "dying of consumption" for the present.

*Case 25.*—Mrs. W. A., age 62. Has been for years subject to constant neuralgia—trifacial—of the most aggravated form, accompanied by severe chronic dyspepsia. Stomach tolerates very little food of any kind, and her sufferings are agonizing in the extreme. It is hardly thought that treatment will do much for her, especially since her circumstances do not permit the most efficient form of office treatment. Contrary to expectation, the thorough use of the portable form of oxygen four times a day is followed by marked and immediate relief of the paroxysms. The digestive system also promptly responds, and within a week or ten days she is enabled to partake of nourishing diet, and to digest it. In connection with the inhalations this patient is directed to take internally, of the 15 volume solution of chemically pure hydrogen dioxide, a teaspoonful well diluted, before each meal.

This treatment is still being followed, and improvement is steady in all directions.

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NOTE.—By "modified oxygen" is meant oxygen mingled with a greater or less per cent. of nitrogen monoxide, according to the indications in each particular case, and this diluted more or less with common air.

The "portable variety" referred to consists of a definite and chemically pure solution of hydrogen dioxide in distilled water, protected from too easy decomposition by the addition of a small proportion of chemically pure glycerine.



